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OUTLINES OF A SYSTEM OF Vegetable Generation.

By Dr. J. HILL. K

Illuſtrated with FIGURES.

LONDON:
Printed for the AUTHOR;
And to be had of R. BALDWIN, in *Pater-noſter-row*;
T. OSBORN, in *Grays-Inn*; G. SEYFFERT, in *Dean-ſtreet*, *Soho*; and R. WATKINS, Optician, at
Charing-Croſs. MDCCLVIII.

BRITISH MUSEUM

OUTLINES
OF
Vegetable Generation.

The DESIGN.

THE purpoſe of this work is to attempt, on principles not before eſtabliſhed, and from the conſtruction of parts hitherto overlooked, or too lightly regarded, an explanation of the PRODUCTION OF PLANTS.

Since the generation of animals, after ſo many experiments and diſſections, is yet obſcured by many difficulties, we cannot expect ſwift advances in the diſcovery of that of vegetables; in which the parts are ſmaller, their office is leſs known, and their diſſection much more difficult.

No more is attempted here than to lay down the ſketch or firſt deſign of a method, in which this ſubject may, perhaps, be traced ſucceſsfully: outlines which the ingenious are invited to aſſiſt in filling. The courſe of nature is here followed (faithfully, if imperfectly) only in one plant; and what advances are made, have been the reſult of a few months obſervation under a ſingle hand: years, perhaps ages, are required to purſue it thro' the ſeveral orders of the vegetable ſyſtem.

One plant alone is examined to avoid perplexity: others will be eaſily ſubjected to the like enquiry; and they will either confirm this ſyſtem, or eſtabliſh a better. Truth will be one way or other found.

EVERY diſcovery, however ſmall or imperfect, is an advance in knowledge; and has its Value. One new and juſt obſervation is worth all the ſyſtems that ever were invented. I know how to reverence the FLORENTINE and SWEDE; but I ſhall here regard what no author writes: only what nature offers to the ſight, on due inſpection.

THE Enquiries I have attempted have been made with caution; and I ſhall be content to proceed ſlowly. The ſearch being after truth, all conjecture has been baniſhed, till the principles are known: and the little I may have diſcovered, which is publiſhed as an inducement only to proſecute the ſubject, is laid down in terms plain to the unlearned. The gardiner may do more than the philoſopher in this point; for he has the means of conſtant obſervation.

THERE are many things in which plants and animals agree; but there are alſo ſeveral in which, for obvious reaſons, they cannot but differ. Analogy, therefore, may be uſeful; but it muſt be purſued with limitations, or it will miſlead.

CHAP. I.

THE GENERAL STRURTURE OF VEGETABLE BODIES.

TO underſtand a part of any ſubject well, it is neceſſary to have a juſt idea of the whole. The organs employed by nature in the generation of plants, are the immediate objects of this reſearch: but they cannot be perfectly known till we are acquainted with the reſt of the vegetable conſtruction.

A plant is an orgainized body, endued with a power of growth, and a kind of life; but without ſenſation.

PLANTS conſiſt of five parts: 1. The outer bark. 2. The rind. 3. A vaſcular ſeries. 4. The fleſhy ſubſtance. 5. The pith.

THESE are common to all plants, trees and the moſt tender herbs, only differing in con-

conſiſtence. They are moſt diſtinct where they are moſt firm, as in the woody kinds; and leaſt where they are moſt tender, as in the thick ſtalks of bulbous rooted plants. In theſe the inner parts often reſemble ſpunges filled with water; and are only diſtinguiſhed by the gradations of colour.

The ſeveral organs of generation are formed, by continuation only, from one or other of theſe parts.

The parts are always arranged in the order here laid down; the bark outermoſt, and the reſt in that regular ſucceſſion.

The root draws nouriſhment from the earth; and the ſtalk conveys it to the flower. In the flower are placed the organs of generation. Theſe are generally underſtood to conſiſt of the Filaments, with their Antheræ, and the Style with its Stigma, and Rudiment of the fruit: but there are

are other parts equally worthy notice. Theſe not having been ſufficiently obſerved, the ſyſtem of generation has been imperfect.

I propoſe to trace theſe ſeveral parts in a plant, in which they are all large and conſpicuous; tho' the latter have not been before obſerved in it.

THIS plant is a ſpecies of AMARYLLIS; ir is diſtinguiſhed from the reſt by the drooping poſition of the FILAMENTS, and is a native of the American iſlands*.

THE root is a bulb: the ſtalk is naked and a foot high. The leaves are graſſy, but of ſome breadth; the flower is compoſed of ſix petals, and has ſo many FILAMENTS with a ſingle STYLE.

THERE is nothing in this plant ſingular or uncommon: the parts are plain and ſimple; therefore they will be eaſily traced: they

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* *Amaryllis Spatha multiflora, corollis campanulatis æqualibus, genitalibus declinatis.* Linn. Sp. 293.

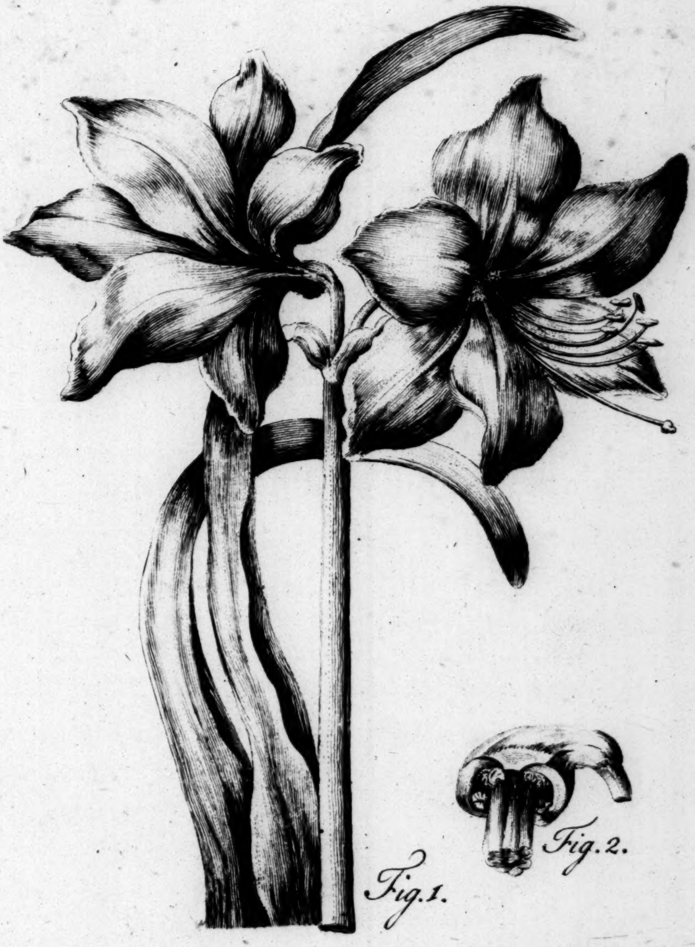
they are very conſpicuous; and they will, probably, be found of the ſame ſtructure in the generality of others. See Pl. I.

THE Bulb is the covering and defence of the young plant: its fibres properly are the roots. The coats of the large part are like thoſe films which encloſe the young ſhoot in the buds of trees, and are deſtined only to that purpoſe.

THE ſtalk is thick, a little flatted, and hollow: a tranverſe ſegment of it repreſents an elliptic ring, with a large aperture. In this the five diſtinct parts of vegetable conſtruction, before enumerated, may, with due care, be traced: and this beſt of all by maceration and diſſection.

THE outer bark is rediſh and filmy: the rind is green and thicker: the vaſcular ſeries is pale: the fleſhy ſubſtance is white: and the pith, which ſurrounds the hollow to

Pl. 1. *Page 8.*



Amaryllis genitalibus declinatis.

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a conſiderable thickneſs, is perfectly cryſtalline, and colourleſs.

THE diviſions of theſe parts are indiſtinctly marked; but they are abſolute. The vaſcular ſeries is whitiſh, the fleſhy ſubſtance white and ſemipellucid, the pith perfectly clear, and altogether colourleſs.

THE bark has many fibres: the four other parts are full of bladders and large veſſels. The bladders are roundiſh, but cruſh'd by preſſing one againſt another: they are ſmalleſt in the rind, and larger all the way to the pith, in the inner part of which they are wideſt of all.

THE veſſels are elliptic, and have large cavities. They are continued in an uninterrupted courſe, from the extreme fibres of the root, to the ſeveral parts wherin they terminate. On this ſtructure depends the courſe of vegetation; which is conducted thus.

THE root being planted in the ground, where there is heat and moiſture, receives nouriſhment ; which expanding and enlarging the embryo plant, ſends it up thro' the ſurface. A ſtalk riſes, on whoſe top appears a membranaceous ſcabbard, containing two flowers : this burſts open, they diſcloſe themſelves ; and beneath each is the rudiment of a ſeed veſſel, in which are ſhells of ſeeds.

THE plant has now perfected its growth, and muſt ſoon after decay : but nature, rather the God of nature, thus prepares a reſtoration.

THE filmy ſcabbard formed from the outer membrane of the ſtalk, having performed its office, fades. The flowers are hardened for the air, and no more need its defence.

THE PETALS, which are ſix, ſurround the ſame number of FILAMENTS, and in the midſt of theſe is the more drooping STYLE.

The conſtruction of the ſtalk is the ſame with that of the fibres of the root; and the ſeveral parts of the plant follow the like rule.

The principal veſſels and fibres of the ſtalk may be traced, in a ſtrait courſe, from the extreme pars of the root, to the ſummits of the ſix filaments in the flower; which properly terminate the vegetation. This I have ſhewn by diſſection, and maceration of the parts: and I am extremely obliged to Mr. *Lee*, nurſeryman at Hammerſmith, who, for the ſpace of ſix weeks, from the middle of *February* to the end of *March*, ſupplied me almoſt daily with freſh plants in flower for the experiments.

The fibres of the root are compoſed, as in all other vegetables, of five ſubſtances. 1. An Outer Bark, and, 2. an Inner Rind, 3. A Single Course of large Vessels, 4. A fleshy Substance, and,

5. A CENTRAL PITH. Of theſe five parts, it will be proper to treat diſtinctly; beginning with the outermoſt: ſeparating them, and caſting them off as we proceed. This way, we ſhall learn the courſe and uſe of the veſſels and fibres of each.

THE extreme filaments are the true root of the plant: the Bulb from which they ſpring, being only, as in other kinds, a covering of the infant ſhoot; ſuch as the buds of trees, and the bulbs upon the ſtalks of SAXIFRAGE, and certain LILLIES.

◆

CHAP.

CHAP. III.

THE COURSE, USE, AND TERMINATION OF THE OUTER BARK.

THE outer bark of the fibres of the root in this plant becomes the outer ſkin of the ſtalk, acquiring greenneſs when it riſes into the air.

THIS, after having covered the whole ſtalk, forms the ſcabbard of the flowers; and there terminates abſolutely: all its fibres and veſſels, contracting there, and looſing themſelves at its top and edges in cloſed ends. No part of them are ſent into any other ſubſtance of the plant.

CHAP IV.

THE COURSE, USE, AND TERMINATION OF THE INNER RIND.

THERE remain to form the flowers and their foot-ſtalks only four parts, the inner rind, the ſingle courſe of veſſels, the fleſhy ſubſtance, and the pith.

THE outer bark being ſeparated, and peel'd off, the inner rind preſents itſelf. Its veſſels and fibres proceed in a ſtrait courſe from thoſe of the root thro' the bulb, and up the whole length of the ſtalk; at whoſe ſummit they divide into two parcels, and form two cluſters; each making a knot, from which riſes the foot-ſtalk of a flower. On theſe parts this rind naturally

turally appears naked, the outer bark having terminated in the ſcabbard.

THE veſſels and fibres may be traced by the help of maceration in theſe knots. They do not terminate in them, but after a few windings, paſs thro' them; and are continued forward up the rind of the footſtalks.

AT the Top of each Foot-ſtalk there is another knot or cluſter of them; in which, after a few windings, they form themſelves into a broader coat. The ſingle courſe of large veſſels appears alſo on the inner part of them very diſtinctly.

THEY form together the ſhell or ſubſtance of the ſeed-veſſel, whoſe rudiment in this plant ſtands under the flower; and is one continuous ſubſtance with it.

All this is form'd by the inner rind of the fibres of the root, continued, under cover, through

through the ſtalk, and naked on the foot-ſtalk, and on the ſeed-veſſel.

From the head of the rudiment of the ſeed-veſſel, this rind is continued in a ſingle Body a little way, and then dividing into ſix parts, it ſpreads out into the ſix petals of the flower.

These are formed only of the rind of the foot-ſtalk; and the change of colour is worthy obſervation. In the root this ſubſtance, which is there the inner Rind, is of a reddiſh brown; in the ſtalk it is of a ſtrong green; this colour it preſerves in the foot-ſtalks of the flowers; in the rudiment of the capſule it is of a deeper green; in the baſe of the flower, which is placed immediately above this, it is paler; and thence by degrees, as it aſcends the petals, it becomes ſpotted with red, and afterwards red entirely.

THE veſſels and fibres of this part are very conſpicuous in the flower; and they terminate abſolutely at the ſides and tops of the petals: as thoſe of the outer rind did in the ſcabbard.

THUS we ſee the end of the ſecond coat of the plant; and there remain the three others entire, for the conſtruction of the ſeveral parts of fructification.

CHAP. V.

THE COURSE, TERMINATION, AND USE OF THE SINGLE SERIES OF VESSELS BETWEEN THE INNER RIND AND FLESHY SUBSTANCE.

IN the conſtruction of the outer bark and of the inner rind, there are mixed with the ſap-veſſels, fibres in which I have never been able to trace any cavity; and air-tubes in great abundance: but 'tis not ſo in regard to the veſſels next under, or within the inner rind.

THESE are large and few: they are continued in a regular chain all round the ſtalk, between the inner rind and the fleſhy ſubſtance: and there are no other veſſels or fibres mixed among them.

THESE I have traced in well macerated, and afterwards in freſh diſſected ſtalks, in an uninterrupted courſe along the main ſtem, thro'

thro' the knots at the diviſion for the origin of the foot-ſtalks of the flowers, thro' thoſe foot-ſtalks and thro' the rudiment of the ſeed veſſel, and the ſolid baſe of the flower; but they do not run up the petals, thoſe being form'd only of the inner rind.

THESE veſſels terminate within the body of the flower, juſt above its ſolid baſe: but they communicate in a wonderful manner by lateral branches with the veſſels of the filaments, which run cloſe to them.

THERE is a part in this flower which, tho' extremely ſingular and elegant, no author has hitherto obſerved. Linnæus, who has otherwiſe very correctly given the character of the Amaryllis, has not mentioned it: but 'tis eaſy to know, from his manner in other caſes, that when thus pointed out to him, he will call it the NECTARIUM, or its ſeveral diſtinct portions, the NECTARIA of the flower.

THESE parts are too conſiderable to have been made without ſome purpoſe. It is but lately the Nectaria of flowers have been known; and thoſe who did not take them into the account of generation, could not explain it rightly.

In this Nectarium the ſingle courſe of veſſels terminates: and for its uſe they are plainly ordained by nature.

When a flower of this plant is perfectly open, if we look ſteadily into it, we ſhall ſee near the baſe of each petal, between that and the filament, a tuft of feathery matter. See Pl. 1. fig. 1. There are ſix of theſe tufts, and they are the parts here treated of: but the filaments, in every view, hide ſome of them. To obtain a better ſight of them, the flower ſhould be cut off tranſverſely at the upper part of its baſe, juſt where it begins to divide into petals: thus the petals and filaments being removed, theſe tufts will appear very diſtinctly. See Pl. 1. fig. 2.

THEY are colourleſs in themſelves, but they appear greeniſh from the green baſe of the flower which is ſeen thro' them: they are ſo large and obvious, that one wonders they have not before been obſerved: they are equal in number to the petals; but they do not riſe from theſe; but in the very clefts formed by their diviſions.

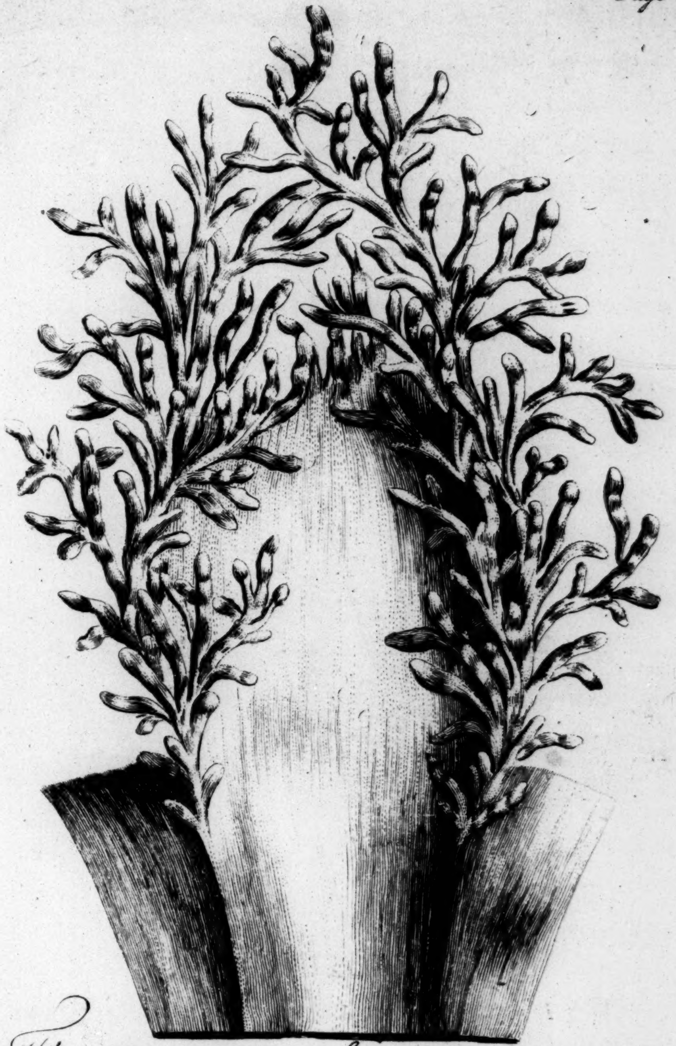
THE deeper the parts lie, the more care is required to trace them: but the ſingle courſe of fibres may be followed from the root up to theſe ſix bodies, in which they terminate; as the veſſels of the outer rind to the ſcabbard of the flowers. I have many times done this happily.

ONE of theſe parts, ſeparated from the baſe of the flower, I have repreſented in Pl. 2. as it appears before the microſcope. The body of it is hollowed, and the top and ſides are jagged. The veſſels at the baſe have formed a continuous ſubſtance; but in theſe parts they ſeparate again, and they terminate in rounded and cloſed ends, without the leaſt aperture any where.

A microſcope of a ſingle lens is beſt for this examination; and I ſcarce know a more pleaſing object. The whole reſembles a piece of fine white coral, but that 'tis pellucid as water. See Pl. II.

WHEN the ſtalk of the plant is cut tranſverſely, a great quantity of watery juice comes from the mouths of the other veſſels: but from theſe, in particular, there iſſues a more tough and clammy fluid. This is of a peculiar nature: it is the ſame in the tufts themſelves: It is moſt tenacious juſt as the flower is opening; and is at that time alſo moſt abundant.

THUS terminate the veſſels of the third ſeries.



The NECTARIUM of the AMARYLLIS.

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CHAP. VI.

THE COURSE, TERMINATION, AND USE OF THE FLESHY SUBSTANCE OF THE STALK.

THE plant being thus cleared of its outer and inner rind, with which laſt this ſingle courſe of veſſels alſo uſually comes off, the inner parts of the ſtalk and foot-ſtalks appear diſtinctly. The petals and the tufts at the baſe of the flower being now alſo removed, there remain only the FILAMENTS and STYLE, in which the veſſels of this inner part of the ſtalk can terminate. To trace theſe, the whole foot-ſtalk muſt be ſplit into thin pieces, and the baſe of the flower with it.

We have ſeen diſtinctly where the inner rind has run up into the petal of the flower; ſwelling in thickneſs, and becoming pale, firſt inwardly, and then entirely; and from that paleneſs red.

THE fleſhy ſubſtance, which conſtitutes the principal part of the ſtalk, is eaſily traced along the foot-ſtalk of the flower within the green rind; making alſo its principal ſubſtance. Thence it follows the rind, and the ſingle courſe of veſſels round the rudiment of the fruit: and at its top terminates moſt diſtinctly in the ſix filaments of the flower.

BETWEEN theſe and the baſe of the ſtyle, there is an abſolute ſpace: and the continuation of the fleſhy ſubſtance of the ſtalk up the filaments, is moſt diſtinctly ſeparated from that organ.

THE filaments plainly have their origin at the head of the rudiment of the fruit: they run looſe and free with their true rounded outline on the inner part: on the outer, they are flatted, and are preſſed cloſe towards the thickened portion of the outer rind, where it begins to form the petal. But they are diſtinctly and moſt plainly ſeparated from it by the ſingle courſe of veſſels. Theſe accompanying the FILAMENTS and baſe of the PETALS ſo far, and ſerving as an union between them, terminate juſt above the part where the filaments ſeparate, in thoſe tufted bodies before named.

THE fleſhy ſubſtance of the ſtalk being at this part diveſted of its three coverings, and even of the pith within, forms itſelf into ſix aſſemblages of a rounded outline, and is continued in each nearly to the length of two inches: theſe are the FILAMENTS.

EACH filament grows ſmaller toward the top; and at its ſummit becomes indeed extremely ſlender.

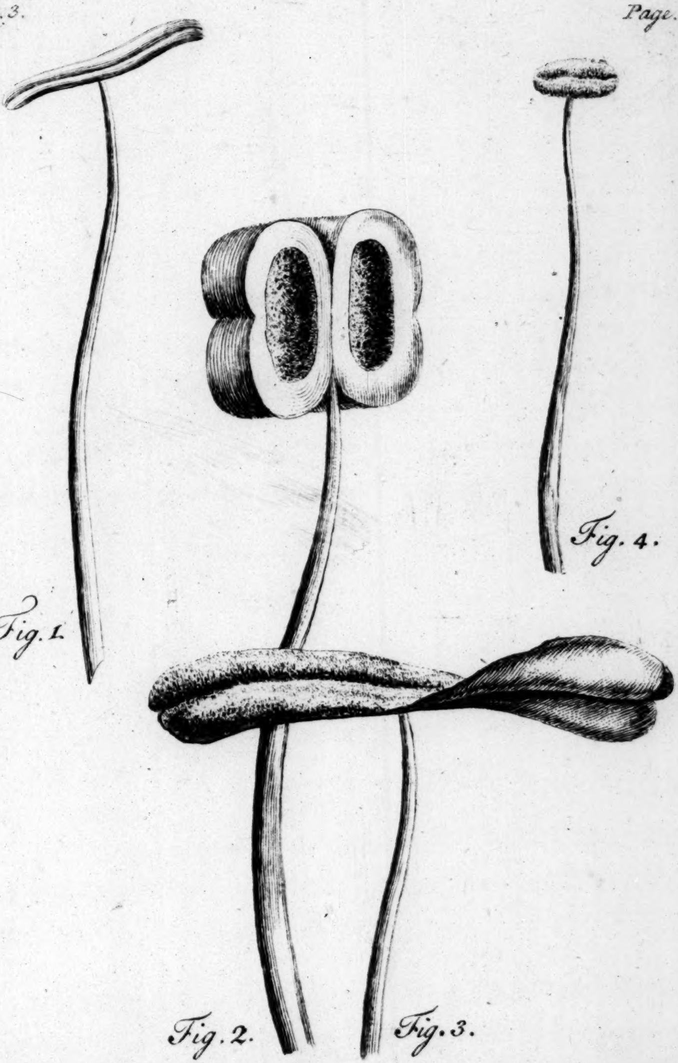
FROM this point the membrane, which had covered it throughout its courſe, dilates, and forms a regular, large and oblong ANTHERA, white at the firſt, and conſiderably long: afterwards ſhorter and yellow.

The filament has no hollow, but is compoſed ſolely and diſtinctly of the fleſhy part of the ſtalk: and the ſame veſſels are ſeen in the ſtalk and here.

The Anthera, examined with a microſcope, appears of a regular and beautiful ſtructure. It is compoſed of two tubes, laid cloſe to one another, each having a groove in the middle. Its outer rind is white, thick and ſpungy; and the two cells are full of a yellow powder, which is the farina. See Pl. III. fig. 1. 2.

When the anthera is ripe, each of its tubes burſts at the groove, and the two ſides ſeparate and turn back. Fig. 3. In this operation the ſpungy ſubſtance of the tubes contracts itſelf; by which they become ſhorter: fig. 4. and the yellow colour is owing to the grains of the yellow farina with which they are covered. If the flowers be carefully watched, this is eaſily ſeen; for the operation laſts in each anthera two or three hours.

Pl. 3. *Page. 26.*



FILAMENTS *of the* AMARYLLIS *with their* ANTHERÆ.

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I have obſerved, that the fleſhy ſubſtance of the ſtalk is compoſed of fibrous as well as vaſcular parts; and I have found by manifold experience, that this is the eſſential part of plants: all the buds being productions of it thro' the rind. This has been attributed to the medullary or central ſubſtance, but experiments ſhew otherwiſe.

THE tubes of the ANTHERA, which are of a looſe ſubſtance, are formed of the fibroſe portion of this fleſhy part of the ſtalk; and the farina of the vaſcular.

THE formation of this is the great object of nature in the growth of plants: and the preſent ſubject affords an opportunity of tracing it moſt plainly.

ALL the particles of the farina are of a regular figure and conſtruction. They are the extreme terminations of thoſe veſſels which form the fleſhy ſubſtance of the ſtalk: and each of theſe terminates in a minute rudiment of a futureplant, carefully and elegantly ſurrounded with membranes; which defend and preſerve it till it comes into the ſeed-veſſel.

This is a new doctrine: but it is founded on the plain conſtruction of the parts. That none have eſtabliſhed it before, is owing to no one's having purſued the courſe of the ſeveral veſſels in plants with attention; or obſerved this moſt eſſential ſubſtance, the FARINA, with ſufficient magnifying powers.

CHAP. VI.

OF THE FARINA OF THE PLANT.

EACH grain of the FARINA in this plant is an oval body, compoſed of three parts, a membranaceous covering, a pulpy matter, and a ſimple but continuous internal ſubſtance.

EXAMINED with a powerful microſcope, each grain is found to adhere by its larger end to the inner ſurface of the tube of the ANTHERA: there is an opening where it thus adheres; and this is continued along the body in form of a ſlight furrow, to the other end.

WHEN the farina is examined by the reflecting microſcope in water, the membranaceous covering appears tranſparent, and the contained ſubſtance is continued along its whole length: but it is not nearly equal to the breadth of the covering.

At the lower end of this is ſeen, as it were, a little bulb, where it adhered to the anthera: and from this is continued a ſingle waved leaf, graſſy and long. See Pl. IV. fig. 1.

This is the rudiment of the future plant: it is the extreme termination of the vaſcular part of the fleſhy ſubſtance of the root, and ſtalk; which never terminate any otherwiſe.

Around this minute plant there is collected a vaſt quantity of tough and ſemipellucid matter in globules; and it is generally cloſer preſſed at the top than elſewhere, becauſe the farina is there narrower; ſo that it ſometimes reſembles a ſecond bulb. Fig. 2.

This is the original appearance of the globule of farina: but when it has lain ſometime in water, it thus prepares for burſting.

The whole globule grows ſhorter, and the included plant, with its pulpy matter, is drawn into a ſmaller compaſs. Fig 3. and 4. Soon after, the globule burſts along

the

Pl. 4.

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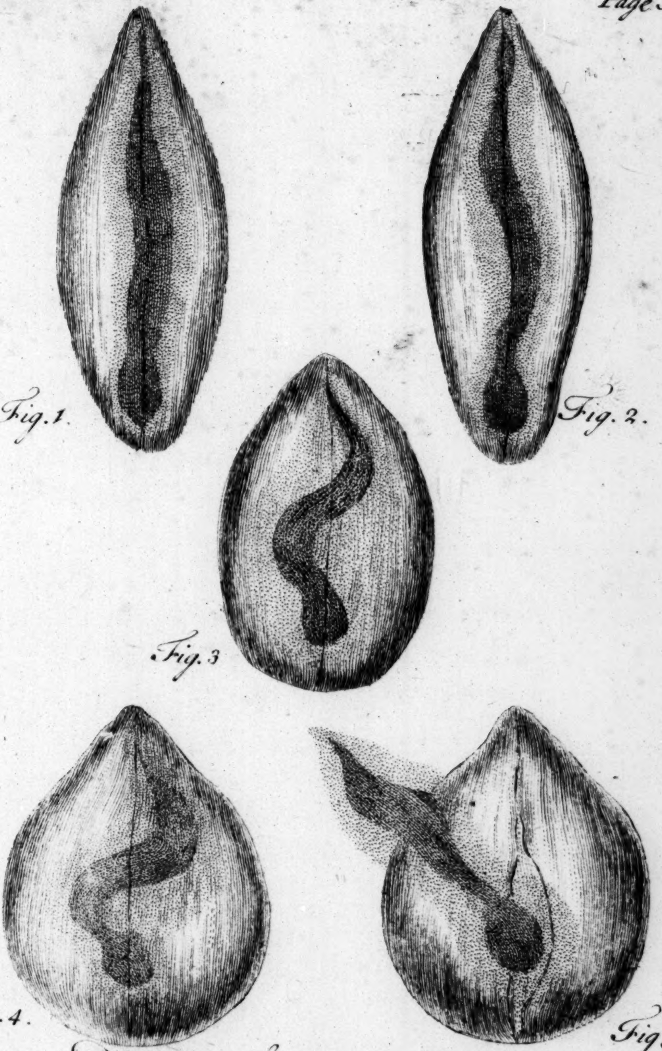
Fig. 1.
Fig. 2.
Fig. 3
Fig. 4.
Fig 5

Farina of the Amaryllis

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the furrow, and the rudiment of the future plant, together with its pulpy matter, comes out of it. Fig. 5.

THIS happens in the courſe of nature; as well as in water before the microſcope: and we ſhall ſee preſently what becomes of the incloſed ſubſtance. Firſt it will be proper to underſtand perfectly the thing itſelf.

THE extreme growth of a plant is thus found to be the rudiment of another plant of the ſame kind: this is encloſed in a membrane, which, I think, is double; and is placed within a tube at the extreme part of the plant.

IF the rudiment were not thus defended, its tender ſubſtance would wither as ſoon as it was formed.

ALONG the ſtalk, juſt over the fleſhy part from which this minute rudiment is produced, we ſee a peculiar courſe of veſſels ſecreting a tough matter, differing from the other juices of the plant.

THESE veſſels terminate in the NECTARIA at the baſe of the filaments: and thoſe NECTARIA are compoſed of veſſels cloſed at their ends; in which this tough juice is perfected.

THESE veſſels, we have ſeen, communicate with thoſe of the FILAMENTS: therefore the tough juice they contain is delivered into the veſſels of the FILAMENTS, and is ſo carried up to the ANTHERÆ.

THE membrane or bladder, containing the rudiment of the plant, is much too large for that minute original: this is deſigned by nature to give room to a peculiar ſubſtance intended to be ſpread about it for its protection, and defence.

THIS peculiar ſubſtance is the tough juice, ſecreted in the NECTARIA or extremities of the ſingle courſe of veſſels: and this being delivered from them into the veſſels of the filament, is carried up thro' them to the ANTHERÆ and de-

delivered into the globule of farina, at that part where it adheres to the inner coat of the tube.

THIS tough juice is true fluid wax. It is well known that bees collect their wax from the Antheræ of flowers; and this is the original ſubſtance. They feed upon the globules of farina; the vegetable rudiment ſerves them as nouriſhment; and this tough ſubſtance is diſcharged again at their mouths, and being thus ſeparated from the minute plant and its juices, it is true wax.

NO ſubſtance could be ſo proper for defence of the rudiment of the plant; for this is tough and ductile, ſo that it will paſs with it thro' the neceſſary channels; and not ſeparate from it: and it cannot be diſſolved, and waſh'd off from it; becauſe wax is indiſſoluble in water.

THUS is the new plant produced from the extreme part of the old: and thus it is encloſed and defended. But this membrane would ſoon ſhrivel; and this pulp of waxy matter decay; and the young plant would be incapable of preſervation, till the induſtry of man, or accidents of nature, committed it to the ground. It is, therefore, lodged afterwards in the ſeed; and there defended ſufficiently.

Before we advance to this laſt conſideration, it may not be improper to obſerve, that this conſtruction of the farina, tho' different from what former authors have deſcribed, does not contradict the truth of their repreſentations.

They ſay the globule of farina burſts, and diſcharges a quantity of atoms: the waxy ſubſtance, not mixing with the juices of the plant, which are watery, always appears compoſed of minute and ſeparate particles, even in the body of the globule; and when it is diſcharged into the water, in which the farina is laid before the microſcope, it appears ſtill more diſunited. Theſe little particles were, perhaps, what they have called atoms; and they did not obſerve the rudiment within.

CHAP. VI.

OF THE COURSE, USE, AND TERMINATION OF THE PITH.

THE Pith is the innermoſt ſubſtance of a plant, of whatſoever nature or conſtruction that be.

IN the fibres of the root of this Amaryllis, it forms the central part, and it is like the other portions of the root, continued up into the ſtalk: but this ſtalk being hollow, it only forms the inner lining of it. 'Tis placed under or within the fleſhy ſubſtance which terminates in the filaments; and it forms the ſtyle and the inner coat of the ſeed-veſſel; which is, indeed, a continuation only of the ſame ſubſtance.

THE four other coats of the plant being laid open, or by a careful maceration removed, this central matter appears: and we may purſue its courſe eaſily thro' the plant, from the extreme fibres of the root, to the ſtigma or head of the ſtyle.

The others, by degrees, leave it; terminating in the ſeveral parts we have named: and its final courſe, under covert of any them, is in the rudiment of the ſeed-veſſel.

Having made the inner coat of this, it contracts itſelf into a kind of neck in the top of that rudiment: and this being continued in length, forms the ſtyle; which accompanies the filaments a little way, but then droops under them, and exceeding them in length, terminates in a ſtigma or head, divided into three rounded parts.

CHAP. VII.

THE CONSTUCTION OF THE STYLE OF THIS AMARYLLIS.

THE central ſubſtance in this plant is every where looſe and ſpungy; compoſed of large veſſels, and abounding with a watery juice.

THE ſtructure is the ſame in the ſtyle: this is looſe, ſpungy, tender, and watery; and is only covered with a thin membrane.

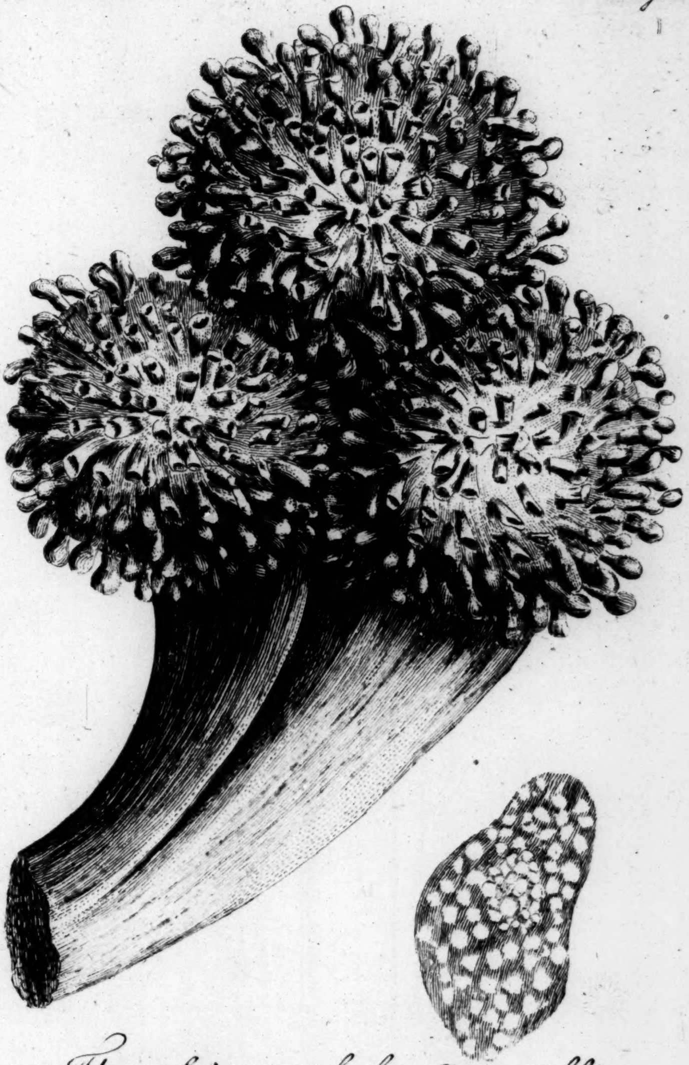
IT has been thought eſſential to the fœcundation of the ſeeds in plants, that the ſtyle ſhould be hollow: many have been perplexed at not finding it ſo; and ſome, to the ſcandal of philoſophy, have figured hollow ſtyles, where they did not find them, to favour their ſyſtems.

In this plant the ſtructure is eaſily traced, and it is highly elegant. The ſtyle has not an abſolute cavity, but the purpoſe of ſuch a one is plainly anſwered ; and we ſee how.

The ſtigma or head of the ſtyle, which is the extreme part or termination of the pith of the plant, viewed with a microſcope, appears compoſed of three rounded parts, reſembling irregular ſegments of ſpheres : and the whole ſurface of theſe is covered with prominent tubercles white as ſnow. See Pl. V. fig. 1.

The general colour of the ſtyle is crimſon ; and ſuch is the outer part of each of theſe diviſions of the head ; but in the midſt of each is a white ſpungy ſubſtance.

The prominent particles on the verge of each diviſion of the ſtigma are cloſed at their ends, and even thickened in a clavated manner : but thoſe which riſe from the white central part of each diviſion are open : they



The Stigma of the Amaryllis.

I. Hill del et Sculp.

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are the mouths of ſo many tubes, and they are larger than the others.

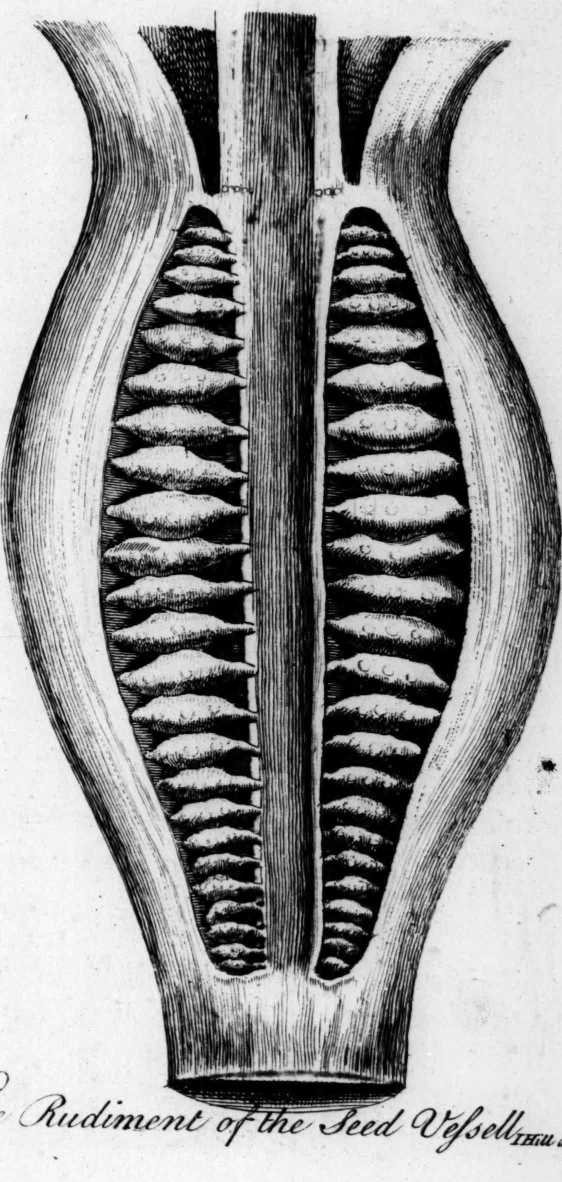
THE open mouths of theſe are wide enough to admit, with eaſe, one of the minute rudiments lodged in each grain of the farina; with its pulp of waxy matter about it.

THE three general paſſages from the ſeparate portions of the ſtigma, unite at a ſmall diſtance below that part, and from one common paſſage of the ſame kind; which may be diſtinguiſhed in a tranſverſe ſection of any part of the ſtyle. See Pl.V. fig. 2. And when that organ is opened longitudinally, with due care, this paſſage ſhews itſelf in its ſingle ſtate along the ſtyle, with its diviſion into three branches for the three parts of the ſtigma. In the lower part, it does not terminate with the reſt of the ſtyle, but is continued in form of a column, thro' the centre of the ſeed-veſſel, every where united to the rudiments of the ſeeds.

THIS central part of the ſtyle is form'd of the largeſt veſſels of the pith of the plant, with ſome few air tubes intermixed, and a very ſmall number of hard fibres.

As the vaſcular part of the fleſhy ſubſtance of the plant ſwelled out into veſſels or membranaceous bladders in the antheræ; in the ſame manner the vaſcular part of this pith, where it runs like a column down the centre of the ſeed-veſſel, ſwells out on every ſide into the ſame kind of bladders: and theſe are the ſhells of ſeeds. Pl. VI.

ALL this may be diſtinctly ſeen in the new form'd rudiment; and the only difference between theſe ſhells of the ſeeds and the membranes of the farina is, that they are more firm, and have about them ſomewhat of a ſpungy ſubſtance.



The Rudiment of the Seed Veſsell J.Hill del et Sculp.

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CHAP VIII.

THE MANNER OF IMPREGNATION.

THIS is the ſtructure and conformation of the AMARYLLIS here deſcribed: and thus the method of impregnation is eaſily ſeen. Like all the other operations of nature, being truly underſtood, it is found much more plain and ſimple than men of contemplation had imagined.

THE fleſhy ſubſtance of the root and ſtalk is the eſſential part of the plant: its growth is the growth of the plant; and nature has for this reaſon lodged it under three coverings from the outer air, and under the defence of a fourth within the hollow ſtalk.

THIS part, in the common growth and encreaſe of plants, continues, and protrudes itſelf downwards in the fibres of roots, and upwards in ſtalks and branches: this puſhes out ſmall rudiments of the entire plant in form of buds along the branches; and this terminates in the ſame kind of rudiments, tho' extremely minute, in the ANTHERÆ on the heads of the FILAMENTS: theſe parts being the final terminations of its growth.

THE rudiments, which this fleſhy ſubſtance ſends out in form of buds on the branches, are defended by many films; and theſe, which terminate its growth in the Antheræ, have their membranaceous covering alſo; and within it a pulpy matter, indoſſoluble, as we have ſhewn, in water, yet eaſily ductile.

THESE are too tender to be truſted to the air; and the courſe of nature being irregular in their falling to the ground, as winds and ſeaſons vary; this is the method of their preſervation.

WHEN the flower is newly opened, the Antheræ are long and white, therefore they are entire; and the ſtigma is ſmall, flattiſh, and dry.

When the Antheræ burſt, the ſtigma ſwells; its three diviſions become more prominent; and the white particles riſe higher above their ſurface.

The Antheræ contract and harden ſoon after they are opened; and by this means the grains of farina are rendered looſe upon them; and the leaſt motion of the air ſhakes them off. Multitudes are ſcatter'd and loſt; but a great many fall upon the ſtigma: and whatever falls there, is detained by its rough and froſted ſurface.

The top of the ſtigma is always moiſt; and we ſee under the microſcope the effect of water on the grains of farina: they burſt in it; and diſcharge their contents.

It is the ſame when they fall upon the ſtigma, loaded as it conſtantly is at that time, with moiſture. They burſt; and there thus iſſues out of each grain of farina a minute plant, ſur-

ſurrounded every way with a tough, ductile, and indiſſoluble ſubſtance.

THE mouth of a tube is open to receive this; and the courſe of the tube is with an equal diameter through a ſpungy part in the centre of the ſtyle.

THE inſide of the tube is moiſt; and the minute rudiment thus received into it is forced along by the ſame power by which leaves and all other parts of plants imbibe dews, and tranſmit the moiſture inwards.

THE minute plant thus carried thro' the length of the ſtyle, and into that part of it which runs like a column down the centre of the ſeed-veſſel, can be forced no farther, for there is no more paſſage: this ſpungy column has no communication but with the ſtyle itſelf. We have ſeen that on each ſide its vaſcular part has formed a kind of ſhells or bladders: the paſſages into theſe are open; and

and the minute rudiment is naturally forced into one or other of them.

In this manner, the firſt grains of farina, which fall on the ſtyle, deliver their rudiments of plants to the tubes; and all the ſhells of the ſeeds are, in ſucceſſion, occupied.

As ſoon as this is done, the ſtyle having performed its office, fades: and all that appears to receive any nouriſhment from the root, is the ſeed-veſſel. The ſhells of the ſeeds become thickened; and a farinaceous ſubſtance, formed of the drying juices of the vaſcular part of the pith, ſurrounds the minute plant in that covering: thus is the ſeed compleated, and vegetation in the plant then ſtops entirely.

Each thus ſeed contains a minute plant, ſo well defended, that it can bear, like that in a bulbous root taken out of the earth, the common injuries of the ſeaſons: and when committed to ground at a time when there is due heat and moiſture, it grows as the rudiment in the root; and in the ſame courſe forms its own ſeeds again.

THIS, by the preſent example, appears to be the courſe of nature in the production of plants: and if it ſhall be confirmed in others, we ſhall have no need any more to have recourſe to elaſtick atoms, or impregnating air: what is called the production of new plants will be found nothing more than the continued growth of the old: the rudiment in the ſeed being only a piece of the fleſhy ſubſtance of the ſtalk delivered into that part from the globule of farina; and with the requiſite heat and moiſture continuing to grow.

FINIS.

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